

WHAT IS CLAIMED IS:

1. An isolated DNA molecule encoding a zebrafish bone morphogenetic protein 4 gene, comprising a nucleic acid sequence selected from the group consisting of SEQ. ID NO. 1, SEQ. ID NO. 4, SEQ. ID NO. 7, SEQ ID No. 8, SEQ ID No. 9 and derivatives and fragments thereof.
2. A recombinant expression vector comprising a portion of the isolated DNA molecule of claim 1.
3. The recombinant expression vector of claim 2, wherein the portion of the isolated DNA molecule is operatively linked to a nucleotide sequence encoding a heterologous expression product.
4. The recombinant expression vector of claim 3, wherein the heterologous expression product is a reporter protein selected from the group consisting of β -galactosidase, luciferase, chloramphenicol acetyl transferase (CAT), green fluorescent protein (GFP), human growth hormone, alkaline phosphatase, β -glucuronidase, and combinations thereof.
5. A cell comprising the isolated DNA molecule of claim 1.
6. An embryo comprising the isolated DNA molecule of claim 1.
7. A transgenic zebrafish comprising the isolated DNA molecule of claim 1.
8. An embryo comprising an expression sequence operably linked to a DNA sequence encoding a heterologous expression product, wherein the expression sequence is selected from the group consisting of a portion of a zebrafish bone morphogenetic protein 4 promoter region, zebrafish bone morphogenetic protein 4 proximal regulatory sequences, zebrafish bone morphogenetic protein 4 distal regulatory sequences, SEQ. ID NO. 1, SEQ. ID NO. 4, SEQ. ID NO. 7, SEQ. ID NO. 8, SEQ. ID NO. 9, and derivatives and fragments thereof.
9. The embryo of claim 8, wherein the heterologous expression product is a reporter protein selected from the group consisting of β -galactosidase, luciferase, chloramphenicol acetyl transferase (CAT), green fluorescent protein (GFP),

human growth hormone, alkaline phosphatase, β -glucuronidase, and combinations thereof.

10. The embryo of claim 9, wherein the reporter protein is green fluorescent protein.

11. The embryo of claim 8, wherein the expression sequence directs stable expression of the heterologous expression product.

12. The embryo claim 8, wherein the expression of the heterologous expression product is transmitted through the germ line.

13. The embryo of claim 8, wherein the expression sequence and the sequence encoding the heterologous expression product are contained in an exogenous construct.

14. The embryo of claim 8, wherein the exogenous construct is integrated into the genome of the embryo.

15. The embryo of claim 8, wherein the embryo is a zebrafish embryo.

16. The embryo of claim 15, wherein the zebrafish embryo is developed into an adult transgenic fish containing the expression sequence to direct the expression of the heterologous expression product.

17. The embryo of claim 8, wherein the expression sequence is a tissue-specific expression sequence.

18. The embryo of claim 17, wherein the expression sequence is a heart-specific expression sequence.

19. The embryo of claim 17, wherein the expression sequence is for expression in tissues and organs selected from the group consisting of eyes, otic vesicles, hatching gland, anus, caudal fin, and combinations thereof.

20. An isolated tissue-specific transcriptional regulatory DNA fragment comprising a DNA sequence selected from the group consisting of SEQ. ID NO. 1,

SEQ. ID NO. 7, SEQ. ID NO. 8, SEQ. ID NO. 9, and derivatives and fragments thereof.

21. The isolated tissue-specific transcriptional regulatory DNA fragment of claim 20, wherein the DNA sequence is derived from SEQ. ID NO. 1, and derivatives and fragments thereof for directing heart-specific expression.

22. The isolated tissue-specific transcriptional regulatory DNA fragment of claim 20, wherein the DNA sequence is derived from SEQ. ID NO. 1, SEQ. ID NO. 7, SEQ. ID NO. 8, SEQ. ID NO. 9, and derivatives and fragments thereof for directing expression in tissues and organs selected from the group consisting of eyes, otic vesicles, hatching gland, anus, caudal fin and combinations thereof.

23. A method for identifying a potential agent that regulates bone morphogenetic protein 4 expression, comprising:

introducing into a cell a recombinant expression vector comprising DNA sequences selected from the group consisting of a portion of a zebrafish bone morphogenetic protein 4 promoter region, zebrafish bone morphogenetic protein 4 proxiaml regulatory sequences, zebrafish bone morphogenetic protein 4 distal regulatory sequences, SEQ. ID NO. 1, SEQ. ID NO. 4, SEQ. ID NO. 7, SEQ. ID NO. 8, SEQ. ID NO. 9, and derivatives and fragments thereof, operatively linked to a nucleotide sequence encoding a heterologous expression product;

contacting the cell with a candidate compound; and

monitoring the expression level of the heterologous expression product, wherein altered expression level in the presence of the candidate compound indicates the candidate compound is the potential agent.

24. The method of claim 23, wherein the heterologous expression product is expressed tissue-specifically.

25. The method of claim 24, wherein the heterologous expression product is expressed in heart tissue.

26. The method of claim 23, wherein the cell is an embryo.

27. The method of claim 23, wherein *in vitro* expression level of the heterologous expression product is monitored.

28. The method of claim 23, wherein *in vivo* expression level of the heterologous expression product is monitored.

29. The method of claim 28, wherein the *in vivo* expression level is monitored by determining a percentage of a population of cells that include the recombinant expression vector expressing the heterologous expression product.

30. A method for identifying a potential agent that affects zebrafish tissue specific expression, comprising:

introducing into a cell a zebrafish tissue-specific expression sequence operatively linked to a nucleotide sequence encoding a heterologous expression product;

contacting the cell with a candidate compound; and

monitoring the expression level of the heterologous expression product, wherein altered expression level in the presence of the candidate compound indicates the candidate compound is the potential agent.

31. The method of claim 30, wherein the zebrafish tissue-specific expression sequence is selected from the group consisting of a portion of a zebrafish bone morphogenetic protein 4 promoter region, zebrafish bone morphogenetic protein 4 proximal regulatory sequences, zebrafish bone morphogenetic protein 4 distal regulatory sequences, SEQ. ID NO. 1, SEQ. ID NO. 4, SEQ. ID NO. 7, SEQ. ID NO. 8, SEQ. ID NO. 9, and derivatives and fragments thereof.

32. The method of claim 30, wherein the zebrafish tissue-specific expression sequence is for expression in tissues selected from the group consisting of heart, eyes, otic vesicles, hatching gland, anus, caudal fin and combinations thereof.

33. The method of claim 31, wherein the tissue-specific expression sequence comprises SEQ. ID NO. 1 for heart-specific expression.

34. The method of claim 30, wherein the cell is an embryo.

35. The method of claim 32, wherein *in vitro* expression level of the heterologous expression product is monitored.

36. The method of claim 32, wherein *in vivo* expression level of the heterologous expression product is monitored by determining a percentage of a population of cells that include the recombinant expression vector expressing the heterologous expression product.

37. A method for screening an effector that regulates bone morphogenetic protein 4 expression, comprising:

providing a transgenic cell containing a recombinant expression vector having DNA sequences of a portion of a zebrafish bone morphogenetic protein 4 regulatory region operatively linked to a nucleotide sequence encoding a heterologous expression product;

introducing a foreign DNA from a cDNA library into the transgenic cell; and

monitoring expression levels of the heterologous expression product for a number of the transgenic cell having foreign DNA from the cDNA library, wherein altered expression level in the presence of the foreign DNA, as compared to an expression level in the absence of the foreign DNA, indicates the foreign DNA encodes the effector.

38. The method of claim 37, wherein the transgenic cell is a zebrafish embryo.

39. The method of claim 37, wherein the DNA sequences of a portion of a zebrafish bone morphogenetic protein 4 regulatory region are selected from the group consisting of SEQ. ID NO. 1, SEQ. ID NO. 4, SEQ. ID NO. 7, SEQ. ID NO. 8, SEQ. ID NO. 9, and derivatives and fragments thereof.

40. A method for identifying an expression pattern of a zebrafish BMP4 expression sequence, comprising:

providing the zebrafish BMP4 expression sequence operatively linked to a nucleotide sequence encoding a heterologous expression product;

introducing into a cell the zebrafish expression sequence; and

monitoring the expression level of the heterologous expression product, thus identifying the expression pattern of the zebrafish expression sequence.

41. The method of claim 40, wherein the zebrafish BMP4 expression sequence is selected from the group consisting of a portion of a zebrafish bone morphogenetic protein 4 promoter region, zebrafish bone morphogenetic protein 4 proximal regulatory sequences, zebrafish bone morphogenetic protein 4 distal regulatory sequences, SEQ. ID NO. 1, SEQ. ID NO. 4, SEQ. ID NO. 7, SEQ. ID NO. 8, SEQ. ID NO. 9, and derivatives and fragments thereof.

42. The method of claim 40, wherein the zebrafish BMP4 expression sequence is a heart-specific expression sequence.

43. The method of claim 40, wherein the cell is an embryo.

44. The method of claim 40, wherein the expression level is monitored *in vitro*.

45. The method of claim 40, wherein the expression level is monitored *in vivo* by determining a percentage of a population of cells that include the recombinant expression vector expressing the heterologous expression product.